Appendix A

CAMU Position Paper

Regulatory Analysis regarding the ICDF Evaporation Pond Corrective Action Management Unit (CAMU)

Regulatory Issue: The Regulatory Agencies have indicated on several occasions that verification sampling will be required in order for liquid wastes to be accepted into the Evaporation Pond at the ICDF complex. This raises the following issues:

1. What is the impact of the CAMU rule being withdrawn and re-proposed?

2. Since the Evaporation pond has been designated as a CAMU what are the regulatory restrictions on waste being sent to the pond?

3. Is sampling necessary to demonstrate compliance with LDRs?

ROD Language regarding the Evaporation Pond CAMU designation:

A CAMU is defined as "an area within a facility that is used only for managing remediation wastes for implementing corrective action or clean-up at the facility." (40 CFR 260.10) There is language in the OU 3-13 ROD that designates the evaporation pond as a CAMU. The following language has been extracted from the ROD:

> Construct and designate an evaporation pond as a Corrective Action Management Unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.552 and 40 CFR 264 Subparts K and CC) **for the purpose of managing ICDF leachate and other aqueous wastes generated as a result of operating the ICDF complex (ROD Page vii)**[1]
>
> Based on currently available cost information, all Group 3 soils will be disposed in the ICDF. This approximately 80 acre area (including a buffer zone) will be engineered to be TSCA/RCRA-compliant for the purpose of final placement of WAG 3 CERCLA soils. The ICDF will also be designed to function as an INEEL-wide disposal facility to accommodate disposal of CERCLA soils and debris from other WAGs. A Staging, Storage, Sizing, and Treatment Facility (SSST) will also be constructed and operated to prepare CERCLA wastes (i.e., soils, debris, and aqueous wastes, such as purge and decontamination waters), as necessary, for disposal in the ICDF. It is anticipated that this facility will consist of a storage/staging building, an evaporation pond or equivalent surface impoundment, a waste shredder, solidification/stabilization treatment tanks, and associated systems. **The evaporation pond will be designated as a Corrective Action Management Unit (CAMU). The evaporation pond will be designed and constructed to treat ICDF**

[1] Emphasis Added.

leachate and other aqueous wastes generated during operations. (ROD pg. 11-15)[1]

An evaporation pond will be constructed and designated as a corrective action management unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.552 and 40 CFR 264 Subpart K and CC) **for purpose of managing ICDF leachate and other aqueous wastes generated as a result of operating the ICDF complex (ROD Pg. 11-19)[1]**

An evaporation pond will be constructed and designated as a corrective action management unit (CAMU) in accordance with the substantive requirements of IDAPA 16.01.05.008 (40 CFR 264.552 and 40 CFR 264 Subpart K and CC) **for purpose of managing ICDF leachate, purge waters, and other aqueous wastes generated as a result of operating the ICDF complex. (ROD Page 12-21)[1]**

Regulatory Language regarding CAMUs:

EPA outlined the CAMU Concept under the RCRA regulations to aid in accelerating remedial clean-up. In 40 CFR 264 Subpart S--Corrective Action for Solid Waste Management Units EPA addressed the issues of land disposal and the use of CAMUs in remedial activities as follows:

(a) A CAMU must be located within the contiguous property under the control of the owner/operator where the wastes to be managed in the CAMU originated. One or more CAMUs may be designated at a facility.
(1) **Placement of remediation wastes into or within a CAMU does not constitute land disposal of hazardous wastes.**
(2) Consolidation or placement of remediation wastes into or within a CAMU does not constitute creation of a unit subject to minimum technology requirements.
(b) (ii) Inclusion of the regulated unit will enhance implementation of effective, protective and reliable remedial actions for the facility.
(c) (1)The CAMU shall facilitate the implementation of reliable, effective, protective, and cost-effective remedies;
(5)The CAMU shall expedite the timing of remedial activity implementation, when appropriate and practicable;

EPA has addressed the applicability of LDRs to CAMUs in several places. In the preamble to the 1993 CAMU rule EPA stated that:

EPA has found that subtitle C requirements, when applied to remediation wastes, can act as a disincentive to more protective remedies, and can limit the flexibility of a regulatory decision maker in choosing the most practicable remedy at a specific site.

EPA recognizes, of course, that both Superfund and RCRA provide it the authority to compel specific remedies, as long as the remedies are consistent with the goals of the statutes.....Similarly, in a fund-financed remedy under Superfund, EPA can use CERCLA funds to effect a similar remedy. Thus, through its regulatory authority, EPA can, at least in theory, override any regulatory disincentive against a given remedy. In its conduct of the Superfund and RCRA programs, however, EPA has come to recognize the fact that RCRA subtitle C requirements may make more sense when applied to some remedies than to others, and can influence the remedy selection process in undesirable ways.

For example, compliance with LDR requirements may completely eliminate from consideration remedies that would otherwise meet Superfund or RCRA remedial standards, and that might be the most sensible remedy from a technical point of view.

In addressing this situation, the decision maker needs the flexibility to consider a full range of strategies so that one may be selected that promptly and effectively addresses the problem.

This is reflected in the results of the preliminary CAMU analysis ("Supplemental Information of Corrective Action Management Units (CAMUs)", October 16, 1992) and in the Regulatory Impact Analysis (summarized in section VI. of today's preamble). According to these analyses, the "expanded" CAMU concept, which has been adopted in today's rule, is estimated to result in more treatment of wastes using more effective treatment technologies than would occur under the other regulatory options considered by the Agency. In addition, today's rule is predicted to result in more on-site waste management (vs. off-site management); lesser reliance on incineration; greater reliance on innovative technologies; and a lower incidence of capping waste in place without treatment.
.....-- the level of Agency oversight over remedial actions, the counterproductive constraints and disincentives that subtitle C requirements can impose on the remedy selection process, and the physical and chemical differences that are often found between remediation wastes and as-generated wastes -- suggest that it is sensible and necessary to develop regulations under RCRA for management of remediation wastes that are better tailored to the realities of remediation actions.

Today's final rule for CAMU and temporary units is consistent with that policy objective. As explained earlier, these rules will create a markedly different regulatory framework for applying subtitle C requirements, particularly the LDRs and MTRs, to remediation waste management. (Corrective Action Management Units and Temporary Units; Corrective Action Provisions Under Subtitle C Vol. 58, No. 029 Part II 58 FR 8658 Tuesday, February 16, 1993)

For example, remediation wastes, including hazardous remediation wastes, may be placed into a CAMU without triggering applicability of LDRs or any other unit-specific requirements applying to hazardous waste land disposal units. Thus, remediation wastes generated at a facility, but outside a CAMU can be consolidated into the CAMU, and remediation wastes may be moved between two or more CAMUs at that facility, without triggering LDRs.

Congress did, however, recognize the special problems that might be created by applying the LDRs to remediation wastes in the same manner as to as-generated wastes and provided some relief for remediation wastes placed in the units enumerated in section 3004(k). See e.g., RCRA sections 3004(d)(3) and 3020.

Today's rule addresses the ambiguity in the application of RCRA preventive standards to remediation wastes generated at RCRA facilities, especially the LDRs. Because Congress did not provide direction under section 3004(k) on how the LDRs should apply to areas that are used solely for the management of remediation wastes, and consequently, do not fit within the unit definitions constructed by EPA for as-generated wastes, EPA interprets the definition of "land disposal" in section 3004(k) to exclude the placement of remediation waste in CAMUs under today's rule. EPA believes that this interpretation is reasonable since remedial areas are not a listed regulatory unit under section 3004(k), because Congress recognized that the application of LDRs to remediation wastes might require a different framework than that developed for the application to as-generated wastes, and, as discussed above, because the direct application of preventive standards to remediation wastes is often inappropriate and counterproductive.

Today's rule is thus designed to address RCRA's ambiguity with respect to remediation wastes in a manner which best meets the twin Congressional objectives of minimizing reliance on land disposal by encouraging proper treatment of hazardous remediation wastes and by facilitating prompt and effective corrective action at RCRA facilities. **As a result of today's rule, remediation wastes placed in CAMUs will not be subject to LDRs or other hazardous waste disposal requirements.** (Corrective Action Management Units and Temporary Units; Corrective Action Provisions Under Subtitle C Vol. 58, No. 029 Part II 58 FR 8658 Tuesday, February 16, 1993)

"Other LDR compliance options also continue to exist. For example, under current regulations, "remediation wastes" can be managed in corrective action management units (CAMUs) or temporary units and not be subject to LDR requirements. [Presumptive Remedy for Metals-in-Soils Sites, EPA 540-F-98-054, OSWER 9355.0-72FS, September 1990]

Due to a law suit with the Environmental Defense Fund EPA has proposed changes to the CAMU rule. This proposed rule does allow for the

grandfathering those CAMUs which have already received EPA review and approval./ The language regarding Grandfathering is below
]

J. Grandfathering CAMUs (Secs. 264.550 and 264.551)

At the time of today's notice, there are a considerable number of CAMUs either approved or under consideration. It is important to EPA to keep these cleanups going and to avoid disrupting on-going activities. EPA believes that there will be little incremental gain in redirecting resources to re-analyzing CAMU decisions in light of the new standards. Further, EPA analyzed these CAMUs in developing these proposed revisions and concluded that the CAMU decisions would generally have been the same, or similar, to those that might have been made under the proposed requirements. The Agency therefore is proposing provisions that would allow certain CAMUs to continue to be implemented pursuant to the current rules which are the rules under which they were approved or planned.

EPA is proposing an approach, at Sec. 264.550, under which two classes of CAMUs would remain subject to the 1993 CAMU regulations following final issuance of the CAMU amendments (i.e., would be "grandfathered"). These classes are: (1) CAMUs that are approved prior to the effective date of the final amendments; and (2) CAMUs which were not approved prior to the effective date of the final amendments but for which substantially complete applications (or equivalents) were submitted to the Agency on or before 90 days after the publication date of the proposed rule (i.e., today's Federal Register notice). To continue to operate pursuant to the requirements of the current CAMU rules, CAMUs that fall into either of these classes would be required to operate within the general scope of the originally issued CAMU authorizing document (e.g., permit). If the CAMU changes in a way that exceeds the general scope of its original approval, those changes would be implemented in accordance with the amended CAMU rule. **"Approved" means that the decision to designate a CAMU is final (e.g., the Agency issues a final permit authorizing a CAMU).** The Agency included "(or equivalent)" after the word "application" to address the situation where it is not the responsible party for the cleanup that is requesting a CAMU--e.g., where the Agency imposes such a requirement as part of the remedy in a section 3008(h) unilateral order.

If EPA were not to include this provision, CAMU owner/operators who obtained approval prior to the amendments would be subject to re-evaluation in light of the new CAMU standards when the permit was up for renewal, during Agency-initiated proceedings to specifically include new requirements, or when the contemplated activities otherwise required a modification of the permit or other enabling mechanism, such as an enforcement order. EPA does not believe that this is an efficient use of cleanup resources. Similarly, EPA believes that it would also be a poor use of cleanup resources to require re-evaluation of such CAMUs that are substantially in the approval process. The Agency therefore has

proposed to grandfather CAMUs that have, in the judgement of the oversight agency, substantially complete applications (or equivalents) within three months of publication of this proposal. The Agency does not want owners or operators, or the oversight agencies, to disrupt or slow down the cleanup process by re-visiting prospective CAMUs under a new set of standards where there has been a substantial commitment to the process. EPA believes that it will be disruptive for facilities that are within 90 days of a substantially complete CAMU application (under the 1993 rule) at the time this proposal is issued to stop and conduct analyses in an effort to assess whether modifications would be warranted because of this proposal; EPA also believes that the three-month period from proposal would provide a reasonable time for owners or operators significantly invested in applying for a CAMU under the existing regulations to work with oversight agencies to ensure that a substantially complete application is submitted if they wish to obtain a CAMU under the existing CAMU regulations.

Under the proposed approach, EPA would interpret "substantially complete application" to mean that an application reflects that enough good-faith work has been done on it that imposition of the new requirements would be an inefficient use of a facility's and the Agency's cleanup resources. The Agency would expect, at the least, that the application is at a point at which it thoroughly and carefully addresses the main elements of CAMU designation that address long-term protectiveness, including the location of the CAMU, wastes proposed for management, technical design elements, and description of anticipated treatment, if any, of the wastes. This does not mean, however, that the application would have to be at a point where it would be deemed "complete" under the permitting requirements of Sec. 270.10(c), which generally means that it be ready for proposal and public comment. For example, EPA would generally expect a substantially complete application, at a CAMU where wastes were to be left in place, to include a reasonable approach for groundwater monitoring that addresses site-specific conditions, but would still consider the application "substantially" complete where the Agency intends to further discuss the details of the groundwater monitoring system. EPA expects that where there has been substantial input by the Agency into the application by the 90th day, there would be a higher likelihood that the application would be found to be "substantially complete." However, there may also be situations where the Agency has yet to engage with the owner or operator by the 90th day, but where the owner or operator has done such a thorough job analyzing the appropriate elements that the Agency would find it "substantially complete." Of course, any CAMU that has been proposed by the Agency by the 90th day would have a "substantially complete application."

EPA expects that many, if not most, CAMUs that are substantially in the approval process by the 90th day after this proposal would be approved by the effective date of the CAMU amendments. For such CAMUs, the proposed provision for "substantially complete" applications would not

be needed. EPA anticipates that there will be cases, however, where CAMUs with substantially complete applications within 90 days of publication of this proposed rule will not receive final Agency approval of their application prior to the effective date of the final CAMU amendments. Reasons for delay could relate to such factors as ongoing administrative processes, including administrative appeals, time involved in receiving and responding to public input, and time needed to work out technical details, such as those involving monitoring well placement and design. In addition, as owner/operators and regulatory agencies might do in preparing for the promulgation of any new regulation applicable to its activities, for those CAMUs with applications that are not expected to be approved by the effective date of the CAMU amendments or to meet the proposed "substantially complete" test by the proposed deadline, EPA suggests using the proposed amendments as guidance (prior to finalization of the amendments) in developing CAMU proposals, as appropriate. This approach would minimize the risk of having to make significant changes to CAMU plans at the time of the final rule. EPA is aware that the proposed amendments may change prior to the final rule; EPA intends to therefore keep the regulated community and oversight agencies apprised of any likely changes. EPA seeks comment on its approach to address the timing of CAMU applications and grandfathering of CAMUs.

Under today's proposal, to avoid the disruptions discussed above, CAMUs that are "grandfathered" would remain subject to the current standards for the life of the CAMU, as long as the "waste, waste management activities, and design of the CAMU remain within the general scope of the CAMU as approved." EPA anticipates two types of circumstances--subject to site-specific determination by the Agency--that generally would be considered "within the general scope of the CAMU as approved." First, changes to waste, waste management activities, and design that can be made without modification of the approved CAMU conditions in the permit would be considered "within the general scope of the CAMU as approved," and would therefore be grandfathered. The same general principal would apply for non-permit decision documents such as enforcement orders. These changes would typically include such activities as modifying sampling and analysis plans or adjusting a treatment technology, based upon implementation in the field. Second, certain circumstances that might require modification of the terms of the CAMU could still remain within the general scope of the originally approved CAMU. Examples of such activities include adding more volume of essentially the same waste (same or similar constituents and origin) that was originally approved, or retaining the same basic design but enlarging a CAMU to accommodate the extra volume of wastes. However, the new amendments would apply under circumstances that are outside of the scope of the originally approved CAMU, such as different types of wastes slated for disposal in the CAMU, or substantial lateral expansion of a CAMU at the site.1. Documentation of "Substantially in the Approval Process." EPA is not envisioning any formal process for documenting that CAMUs are

"substantially in the approval process" by the proposed deadline. Of course, EPA would, if the proposed grandfathering provisions are finalized, expect the Regional Administrator to record and justify this finding in the administrative record for the proposed and/or final CAMU approval. EPA would generally expect that, in addition to filing proper documentation in the administrative record, if requested, the Agency would notify the owner or operator in writing of the Agency's view of the completeness of the application before or shortly after the time of the proposed deadline so that the owner or operator would be on notice of what standards will apply to them if the proposed amendments are finalized and if they do not obtain CAMU approval prior to such finalization.(Federal Register: August 22, 2000 (Volume 65, Number 163, pg 51111 -51113)][Proposed Rules]

Remediation waste is defined as " all solid and hazardous waste, and all media (including groundwater, surface water, soils, and sediments) and debris that contain listed wastes or that themselves exhibit a hazardous characteristic and are managed for implementing cleanup. (40 CFR 260.10)

Issue Resolution:

1. What is the impact of the CAMU rule being withdrawn and re-proposed?

The OU3-13 ROD was signed on October 7, 1999. Regulatory changes after the signing of the ROD "must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment." 40 CFR §300.430(f)(1)(ii)(B)(*1*). The proposed rule clearly allows those units which have been previously negotiated and approved of by the EPA to continue in operation consistent with the 1993 rule making. Therefore, the ROD is fully consistent with the proposed rule, and there is no need to amend the ROD because of any impact from the proposed rule changes.

2. Since the Evaporation pond has been designated as a CAMU what are the regulatory restrictions on waste being sent to the pond?

The only regulatory restriction for waste in the CAMU is that they meet the definition of "remediation waste" as defined in 40 CFR 260.10. The Waste acceptance Criteria needs to state that only remediation wastes may enter the evaporation pond. Then during the waste acceptance process, it must be verified that the waste is remediation waste. Once this determination is made, any remediation waste may be placed in the pond.

The ROD is inconsistent regarding the exact wastes that would be accepted into the CAMU. At a minimum, the ROD intended that the unit be used to manage "**ICDF leachate and other aqueous wastes generated as a result of operating the ICDF complex.**" In other sections the ROD indicates that purge water is also intended for disposal in the evaporation pond.

In conclusion, leachate, other aqueous wastes from ICDF operations and purge water may be disposed of in the unit.

3. Is sampling necessary to demonstrate compliance with LDRs?

The ROD is very clear that the evaporation pond was being built to manage leachate, other aqueous wastes and purge water. The Regional Administrator, placing only these restrictions on the unit signed the ROD, as did the State of Idaho DEQ representative.

EPA established the position in the preamble of the 1993 rule making for CAMUs that LDRs do not apply to these units. Since LDRs are not applicable to the unit, there is no reason to sample to demonstrate that LDRs are being met. The Agencies continued request for this sampling does not have a regulatory, or a technical basis. The sampling will only add cost to the remediation. One of the reasons for establishing CAMUs was to reduce cost.

Sampling to demonstrate compliance with LDRs is not required for the evaporation pond.

Appendix B

Waste Profile and Waste Certification Form

WASTE PROFILE

WASTE PROFILE

PART I

A. GENERAL INFORMATION

WASTE PROFILE NO. _____

1. GENERATOR NAME

2. FACILITY ADDRESS/LOCATION

3. 20 X LDR TCLP
Process Knowledge

4. WAG ID & Uniform Waste Stream

5. TECHNICAL CONTACT

6. TITLE

7. PHONE
( )

8. e-mail:

B. 1. NAME OF WASTE
2. USEPA/or/STATE WASTE CODE(S) _____
3. PROCESS GENERATING WASTE _____
4. PROJECTED ANNUAL VOLUME/UNITS _____ / _____ 5. MODE OF COLLECTION _____
6. IS THIS WASTE A DIOXIN LISTED WASTE AS DEFINED IN 40 CFR 261.31 ? _____
__ YES __ NO
7. IS THIS WASTE RESTRICTED FROM LAND DISPOSAL (40 CFR 268)? __ YES __ NO
HAS AN EXEMPTION BEEN GRANTED? __ YES __ NO
DOES THE WASTE MEET APPLICABLE TREATMENT STANDARDS? __ YES __ NO

PART II

1. MATERIAL CHARACTERIZATION

COLOR(required)
DENSITY _____ BTU/LB _____
TOTAL SOLIDS _____ ASH CONTENT _____
LAYERING: (required) __ MULTILAYERED __
BILAYERED __ SINGLE PHASE

2. RCRA CHARACTERISTICS

PHYSICAL STATE: __ SOLID __ LIQUID __ SEMI-SOLID
__ GAS __ OTHER

TREATMENT GROUP: __ WASTEWATER __ NON-WASTEWATER

__ IGNITABLE (D001)
FLASH POINT (F) _____
__ HIGH TOC (> 10%)
__ LOW TOC (< 10%)

__ REACTIVE (D003)
__ WATER REACTIVE
__ CYANIDE REACTIVE
__ SULFIDE REACTIVE

__ CORROSIVE (D002)
pH _____
__ CORRODES STEEL

__ TOXICITY CHARACTERISTIC
(SEE PART III)

3. CHEMICAL COMPOSITION (ppm or mg/L)

COPPER _____ PHENOLICS _____
NICKEL _____ TOTAL HALOGENS _____
ZINC _____ VOLATILE ORGANICS _____
CHROMIUM-HEX _____ PCBs _____
(OTHER) _____

NOTE: EXPLOSIVES, SHOCK-SENSITIVE, PYROPHORIC,, AND ETIOLOGICAL WASTE NORMALLY MAY NOT BE ACCEPTED BY THE SSA DESIGNEE WITHOUT SPECIFIC APPROVAL.

4. MATERIAL COMPOSITION

COMPONENT	CONCENTRATION	RANGE

TOTAL _____ 100%

5. SHIPPING INFORMATION

DOT HAZARDOUS MATERIAL? __ YES __ NO
PROPER SHIPPING NAME _____

HAZARD CLASS _____ U.N. OR N.A. NO. _____
ADDITIONAL DESCRIPTION _____
METHOD OF SHIPMENT __ BULK __ DRUM __
OTHER:
CERCLA REPORTABLE QUANTITY (RQ) _____
EMERGENCY RESPONSE GUIDE PAGE
DOT PUBLICATION 5800.4 PAGE NO. _____
EDITION (YR)
SPECIAL HANDLING INFORMATION _____

6. GENERATOR INFORMATION

BASIS FOR INFORMATION

__ CHEMICAL ANALYSIS *(ATTACH RESULTS)*

__ USER *KNOWLEDGE (ATTACH SUPPORTING DOCUMENTS - Explain how and why these documents comply with RCRA requirements.*

I, _____, HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN AND ALL ATTACHED
(Print or Type Name)

DOCUMENTS IS TO THE BEST OF MY KNOWLEDGE AN ACCURATE REPRESENTATION OF THE WASTE TURNED IN TO THE SSA.

ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.

SIGNATURE OF GENERATOR'S REPRESENTATIVE	**DATE**

7. WASTE ACCEPTANCE INTO ICDF landfill SSTF Evaporation Pond

SIGNATURE OF ICDF Complex DESIGNEE **Preliminary Acceptance**	**DATE**
SIGNATURE OF ICDF Complex DESIGNEE **Final Acceptance**	**DATE**

PART III

HAZARDOUS CHARACTERISTIC LIST

☐ Total Metals ☐ TCLP* ☐ Process Knowledge

CONTAMINANT	EPA HW No.	(mg/L)	CONTAMINANT	EPA HW No.	(mg/L)
__ ARSENIC	D004		__ HEXACHLORO-1,3,-BUTADIENE	D033	
__ BARIUM	D005		__ HEXACHLOROETHANE	D034	
__ BENZENE	D018		__ LEAD	D008	
__ CADMIUM	D006		__ LINDANE	D013	
__ CARBON TETRACHLORIDE	D019		__ MERCURY	D009	
__ CHLORDANE	D020		__ METHOXYCHLOR	D014	
__ CHLOROBENZENE	D021		__ METHYL ETHYL KETONE	D035	
__ CHLOROFORM	D022		__ NITROBENZENE	D036	
__ CHROMIUM	D007		__ PENTACHLOROPHENOL	D037	
__ O-CRESOL	D023		__ PYRIDINE	D038	
__ M-CRESOL	D024		__ SELENIUM	D010	
__ P-CRESOL	D025		__ SILVER	D011	
__ CRESOL	D026		__ TETRACHLOROETHYLENE	D039	
__ 2,4-D	D016		__ TOXOPHENE	D015	
__ 1,4-DICHLOROBENZENE	D027		__ TRICHLOROETHYLENE	D040	
__ 1,2-DICHLOROETHANE	D028		__ 2,4,5-TRICHLOROPHENOL	D041	
__ 1,1-DICHLOROETHYLENE	D029		__ 2,4,6-TRICHLOROPHENOL	D042	
__ 2,4-DINITROTOLUENE	D030		__ 2,45-TP (SILVEX)	D017	
__ ENDRIN	D012		__ VINYL CHLORIDE	D043	
__ HEPTACHLOR (AND ITS HYDROXIDE)	D031				
__ HEXACHLOROBENZENE	D032				

***TCLP data are required for waste streams where total metals exceed 20X the TCLP LDRs.**

All required analysis for this sheet must be attached prior to submittal.

PART IV
RADIOLOGICAL LIST

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)
^{3}H			^{60}Co		
^{7}Be			^{60}Co act. metal[c]		
^{10}Be			^{63}Ni		
^{14}C			^{63}Ni act. metal[c]		
^{14}C act. Metal[c]			^{65}Zn		
^{22}Na			^{68}Ge		
^{32}P			^{75}Se		
^{35}S			^{79}Se		
^{36}Cl			^{82}Sr		
^{40}K			^{85}Kr		
^{45}Ca			^{85}Sr		
^{46}Sc			^{86}Rb		
^{49}V			^{88}Y		
^{51}Cr			^{89}Sr		
^{54}Mn			^{90}Sr–^{90}Y		
^{55}Fe			^{93}Mo		
^{56}Co			^{93m}Nb		
^{57}Co			^{93}Zr		
^{58}Co			^{94}Nb		
^{59}Fe			^{94}Nb act.[c]		
^{59}Ni			^{95}Nb		
^{59}Ni act. Metal[c]			^{207}Bi		
^{95}Zr–^{95m}Nb			^{210}Pb		
^{99}Tc			^{210}Po		
^{103}Ru–^{103m}Rh			^{226}Ra		
^{106}Ru–^{106}Rh			^{227}Ac		
^{107}Pd			^{228}Ra		
^{108m}Ag			^{228}Th		
^{109}Cd			^{229}Th		
^{110m}Ag–^{110}Ag			^{230}Th		
^{113m}Cd			^{231}Pa		
^{113}Sn			^{232}Th		
^{119m}Sn			Total U		
^{121m}Sn			^{232}U		
^{121}Te			^{233}U		
^{123}Te			^{234}Th		
^{124}Sb			^{234}U		
^{125}I			^{235}U		
^{126}Sn–^{126m}Sb			^{236}Pu		
^{125m}Te			^{236}U		
^{125}Sb			^{237}Np[d]		
^{127m}Te–^{127}Te			^{238}Pu[d]		
^{129}I			^{238}U		
^{129m}Te			^{239}Pu[d]		
^{131m}Xe					

RADIOLOGICAL LIST (continued)

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)

___ ^{133}Ba ___ ^{134}Cs ___ ^{135}Cs ___ ^{137}Cs–^{137m}Ba ___ ^{140}Ba ___ ^{141}Ce ___ ^{144}Ce–^{144}Pr ___ ^{147}Nd ___ ^{147}Pm ___ ^{147}Sm ___ ^{150}Eu ___ ^{151}Sm ___ ^{152}Eu ___ ^{152}Gd ___ ^{153}Gd ___ ^{154}Eu ___ ^{155}Eu ___ ^{170}Tm ___ ^{175}Hf ___ ^{181}Hf ___ ^{182}Ta ___ ^{185}W ___ ^{187}Re ___ ^{195}Au ___ ^{203}Hg ___ ^{204}Tl			___ $^{240}Pu^{d}$ ___ $^{241}Am^{d}$ ___ ^{241}Pu ___ $^{242m}Am^{d}$ ___ ^{242}Cm ___ $^{242}Pu^{d}$ ___ $^{243}Am^{d}$ ___ $^{243}Cm^{d}$ ___ ^{244}Cm ___ $^{244}Pu^{d}$ ___ $^{245}Cm^{d}$ ___ $^{246}Cm^{d}$ ___ $^{247}Bk^{d}$ ___ $^{247}Cm^{d}$ ___ $^{248}Cm^{d}$ ___ $^{249}Cf^{d}$ ___ ^{250}Cf ___ $^{250}Cm^{d}$ ___ $^{251}Cf^{d}$ ___ ^{252}Cf ___ ^{254}Es		

PART V

LABELING	Yes	No
1. Are containers marked with the waste generation date?		
2. Does container have CERCLA label?		
3. Does container have IWTS label?		
4. PCB Containing Waste (40 CFR 761.45)?		
Large PCB Mark (M_L) [for large containers] | Small PCB Mark (M_S) [used for small containers]		

PART VI

PACKAGING TYPE

Waste Type	55 Gallon Drum[a] Or other sized steel drums	Roll Off Containers[a]	Crosslink Polyethylene Tanks (storage) Or tanker truck (transport)		INEEL Wood Boxes[a] 2 x 4 x 8 ft 4 x 4 x 4 ft 4 x 4 x 8 ft
			VCT[c]	VOT[c]	
Hazardous	XX	XX	—	—	XX
RAD[b]	XX	XX	—	—	XX
RAD & Mixed RAD[b]	XX	XX	—	—	XX
Asbestos-TSCA	XX	XX	—	—	XX
Asbestos-TSCA/RAD Waste[b]	XX	XX	—	—	XX
Purge Water	—	—	XX	XX	—
Case-by-Case[d]	XX	XX	XX	XX	XX

a. Drums, roll-offs, and INEEL wood boxes will be lined with polyethylene liners (or supersacks).

b. Low-level radioactive waste shall be packaged for disposal in accordance with 10 CFR 61.56(a). The container must also be surveyed to ensure occupational exposures to radiation are < 500 mR/h at 1 meter for the exterior of the container. If the containers radiation level is > 500 mR/h then the container must be shielded by other containers within the SSA.

c. VCT (Vertical Closed Top) and VOT (Vertical Open Top) above ground tanks will meet or exceed ASTM D 1998-91, Type I: Tanks molded from crosslinkable polyethylene.

d. Wastes accepted on a case-by-case basis could require special container requirements. Therefore, the generator must verify proper containers with 49 CFR 101, Subpart C

NOTE: Other types of containers may be used if they have received approval prior to shipment.

WASTE CERTIFICATION FORM

Package identification number(s): _____

The undersigned certifies that, to the best of his/her knowledge, the waste identified above meets the waste acceptance criteria for the SSSTF. A complete and comprehensive copy of the laboratory analytical data is attached to the waste profile.

_____

Certification:

Name (print) _____

Signature _____

Date _____

Title _____

Phone: _____

Email: _____

Appendix C

Radiological Calculation Methods

Radiological Calculation Methods

A variety of radiological calculations are required to determine whether a waste can be stored at the INEEL SSA. The following sections describe the methodology for performing these calculations. For each calculation, the following assumptions shall be used:

- All major radionuclides in the waste, as defined in Section 2.3.1, must be considered in the calculations. If there is a major radionuclide in the waste that is not listed in Tables C-1 and C-2 (which will be modified as necessary), the generator must notify the SSA to calculate the applicable limits and conversion factors.

- If a daughter radionuclide has a half-life less than 10 days and the parent radionuclide has a half-life greater than the daughter, the activity of the daughter should not be considered in the calculations.

- Except for the NRC Class C calculation, the volume of the waste in each container should be used when limits are expressed in volume concentration (Section C.6 presents information regarding the Class C calculations).

C.1 Transuranic Waste Determination

Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:

- High-level radioactive waste

- Waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations.

C.2 Calculation of Plutonium Equivalents

PU-239 equivalent activity of the following individual waste packages is in accordance with WIPP WAC (INEEL RCRA Permit):

- 5-gallon drums, 80 curies equivalent

- Standard waste box, 130 curies equivalent

- Standard waste box, $\leq$ 1800 curies equivalent

- Solidified/vitrified waste, $\leq$ 1800 curies equivalent

- INEEL Wood Boxes, measuring 2 $\times$ 4 $\times$ 8 ft.

- INEEL Wood Boxes, measuring 4 $\times$ 4 $\times$ 4 ft

- INEEL Wood Boxes, measuring 4 $\times$ 4 $\times$ 8 ft.

C.3 Calculation of Thermal Power

The thermal power of the waste in a container is calculated from the concentration of radionuclides in the waste and the heat of decay from Table C-1. The thermal power calculation is performed in the following steps:

1. The concentration of each radionuclide (expressed in curies per cubic meter) is multiplied by the heat of decay for that nuclide from Table C-1, yielding the heat of decay for each in units of watts per cubic meter.

2. Thermal power is the sum of the heat of decay of all radionuclides in the waste.

C.4 Category 1 Determination

Classification of waste as Category 1 or greater than Category 1 is a sum of fractions calculation, performed in the following steps:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 1 limit (Table C-2).

2. The resulting values are added to form the sum of fractions.

3. If the sum of fractions is less than or equal to 1, the waste is Category 1. If the sum of fractions exceeds 1, the waste is greater than Category 1, and the Category 3 determination must be performed to classify the waste.

C.5 Category 3 Determination

Category 3 determination is performed in the same way as the Category 1 calculation, except that the Category 3 limits from Table C-2 are used as follows:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 3 limit from Table C-2.

2. The resulting values are added to form a sum of fractions.

3. If the sum of fractions is less than or equal to 1, the waste is Category 3. If the sum of fractions exceeds 1, the waste is greater than Category 3.

C.6 Class C Determination

Class C determination shall be performed as specified in 10 CFR 61.55.

C.7 Interim Safety Basis Calculations For Low-Level Storage

The ISB calculations are performed in the following steps:

1. Determine the appropriate set of limits from Table C-2 (i.e., noncombustible containerized waste or combustible containerized waste).

2. Divide the concentration of each radionuclide by its respective limit.

3. Add the resulting values to form a sum of fractions.

If the sum of fractions is less than or equal to 1, the waste lies within the ISB limits. If combustible waste exceeds the combustible waste limit, but does not exceed the noncombustible waste limit, the SSA acceptance organization can perform an evaluation to determine whether segregation or stabilization can be used to mitigate the combustibility hazard. The SSA will not accept noncombustible waste if the noncombustible waste limit is exceeded.

C.8. Mobile Radionuclide Reporting

This is a simple comparison of the concentration of each mobile radionuclide (3H, 14C, 36Cl, 79Se, 93Mo, 99Tc, 129I, 187Re, Total U, and 237Np) against its respective reporting value from Table C-2.

C.9. Calculating Dose-Equivalent Curies

Calculation of Dose Equivalent-Curies (DE-Ci) is a method of normalizing the exposure risk of various radionuclides. DE-Ci limits are established for certain TSD units as part of the safety basis. Calculation of the DE-Ci of a waste container is performed in the following steps:

1. Multiply the activity (in Ci) of each isotope in a given container by its respective DE-Ci correction factor from Table C-1.

2. Add the resulting values to obtain the total DE-Ci of the package.

Table C-1. Conversion factors for general radiological calculations.

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{3}H	4.5034 E+03	9.66 E+03	3.38 E-05	1.49 E-07
^{7}Be	5.3920 E+01	3.50 E+05	2.94 E-04	7.47 E-07
^{10}Be	5.8439 E+08	2.23 E-02	1.20 E-03	8.25 E-04
^{14}C	2.0928 E+06	4.46 E+00	2.93 E-04	4.86 E-06
^{22}Na	9.5032 E+02	6.25 E+03	8.71 E-03	1.78 E-05
^{32}P	1.4262 E+01	2.86 E+05	4.21 E-03	3.61 E-05
^{35}S	8.7510 E+01	4.26 E+04	2.88 E-04	5.76 E-06
^{36}Cl	1.0994 E+08	3.30 E-02	1.43 E-03	5.11 E-05
^{40}K	4.6641 E+11	7.00 E-06	3.33 E-03	2.87 E-05
^{45}Ca	1.6380 E+02	1.77 E+04	4.56 E-04	1.54 E-05
^{46}Sc	8.3790 E+01	3.39 E+04	1.26 E-02	6.90 E-05
^{49}V	3.3000 E+02	8.08 E+03	5.16 E-06	8.04 E-07
^{51}Cr	2.7702 E+01	9.24 E+04	1.93 E-04	7.78 E-07
^{54}Mn	3.1210 E+02	7.75 E+03	4.96 E-03	1.56 E-05

Table C-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{55}Fe	9.9711 E+02	2.38 E+03	9.66 E-06	6.25 E-05
^{56}Co	7.7270 E+01	3.02 E+04	2.02 E-02	9.22 E-05
^{57}Co	2.7179 E+02	8.43 E+03	7.42 E-04	2.11 E-05
^{58}Co	7.0820 E+01	3.12 E+04	4.91 E-03	2.53 E-05
^{59}Fe	4.4503 E+01	4.97 E+04	7.74 E-03	3.44 E-05
^{59}Ni	2.7758 E+07	7.97 E-02	1.36 E-05	3.08 E-06
^{60}Co	1.9253 E+03	1.13 E+03	1.54 E-02	5.09 E-04
^{63}Ni	3.6561 E+04	5.67 E+01	1.01 E-04	7.23 E-06
^{65}Zn	2.4426 E+02	8.22 E+03	3.38 E-03	4.75 E-05
^{68}Ge	2.7082 E+02	7.09 E+03	2.44 E-05	1.20 E-04
^{75}Se	1.1978 E+02	1.45 E+04	2.32 E-03	1.97 E-05
^{79}Se	2.3741 E+07	6.96 E-02	3.14 E-04	2.29 E-05
^{82}Sr	2.5550 E+01	6.23 E+04	4.65 E-05	1.43 E-04
^{85}Kr	3.9285 E+03	3.91 E+02	1.50 E-03	1.64 E-14
^{85}Sr	6.4840 E+01	2.37 E+04	3.07 E-03	1.17 E-05
^{86}Rb	1.8631 E+01	8.15 E+04	4.51 E-03	1.54 E-05
^{88}Y	1.0665 E+02	1.39 E+04	1.59 E-02	6.54 E-05
^{89}Sr	5.0530 E+01	2.90E+04	3.46 E-03	9.65 E-05
$^{90}Sr - ^{90}Y$*	1.0512 E+04	2.76 E+02	5.54 E-03	3.04E-03
^{93}Mo	1.4610 E+06	9.61 E-01	7.41 E-05	6.62 E-05
^{93m}Nb	5.8914 E+03	2.38 E+02	1.09 E-05	6.81 E-05
^{93}Zr	5.5882 E+08	2.51 E-03	1.24 E-04	7.74 E-04
^{94}Nb	7.4144 E+06	1.87 E-01	1.02 E-02	9.65 E-04
^{95}Nb	3.4975 E+01	3.93 E+05	4.68 E-03	1.35 E-05
$^{95}Zr-^{95m}Nb$*	6.4020 E+01	4.42 E+04	4.24 E-04	6.09 E-05
^{99}Tc	7.7103 E+07	1.71 E-02	5.04 E-04	1.93 E-05
$^{103}Ru-^{103m}Rh$*	3.6260 E+01	7.00 E+04	3.36 E-03	2.08 E-05
$^{106}Ru-^{106}Rh$*	3.7359 E+02	6.59 E+03	3.99 E-04	1.11E-03
^{107}Pd	2.3741 E+09	5.14 E-04	5.51 E-05	2.97 E-05
^{108m}Ag	4.6386 E+04	2.61 E+01	9.96 E-03	6.60 E-04
^{109}Cd	4.6260 E+02	2.59 E+03	1.54 E-04	2.66 E-04
$^{110m}Ag-^{110}Ag$*	2.4979 E+02	9.50 E+03	7.19 E-03	1.87 E-04
^{113m}Cd	5.1499 E+03	2.24 E+02	1.08 E-03	3.56 E-03
^{113}Sn	1.1509 E+02	1.00 E+04	1.66 E-03	2.48 E-05
^{119m}Sn	2.9310 E+02	3.74 E+03	6.78 E-05	1.45 E-05

Table C-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{121m}Sn	2.0088 E+04	5.37 E+01	6.59 E-05	2.68 E-05
^{121}Te	1.6780 E+01	6.43 E+04	3.42 E-03	4.43 E-06
^{123}Te	3.6524 E+15	2.91 E-10	1.29 E-03	2.45 E-05
^{124}Sb	6.0200 E+01	1.75 E+04	1.33 E-02	5.86 E-05
^{125}I	5.9408 E+01	1.76 E+04	2.51 E-04	5.62 E-05
^{125}Sb	1.0074 E+03	1.04 E+03	3.14 E-03	2.84 E-05
^{125m}Te	5.7400 E+01	1.82 E+04	2.13 E-04	1.69 E-05
^{126}Sb	1.2460 E+01	8.32 E+04	1.83 E-02	2.73 E-05
$^{126}Sn-^{126m}Sb$*	3.6524 E+07	5.68 E+02	1.23 E-02	2.31 E-04
$^{127m}Te-^{127}Te$*	1.0900 E+02	1.86 E+04	1.36 E-03	5.07 E-05
^{129}I	5.7343 E+09	1.77 E-04	3.93 E-04	4.04 E-04
^{129m}Te	3.3600 E+01	3.01 E+04	1.44 E-03	5.57 E-05
^{131m}Xe	1.1840 E+01	8.42 E+04	1.19 E-04	6.07 E-12
^{133}Ba	3.8423 E+03	2.56 E+02	2.39 E-03	1.81 E-05
^{134}Cs	7.5313 E+02	1.29 E+03	1.02 E-02	1.08 E-04
^{135}Cs	8.4006 E+08	1.15 E-03	3.32 E-04	1.06 E-05
$^{137}Cs-^{137m}Ba$*	1.0983 E+04	1.69 E+02	3.36 E-03	7.44 E-05
^{140}Ba	1.2752 E+01	7.31 E+04	2.72 E-03	8.70 E-06
^{141}Ce	3.2501 E+01	2.85 E+04	8.60 E-04	2.80 E-05
$^{144}Ce-^{144}Pr$*	2.8489 E+02	6.37 E+03	7.34 E-03	8.70 E-04
^{147}Nd	1.0980 E+01	8.09 E+04	2.22 E-03	1.59 E-05
^{147}Pm	9.5818 E+02	9.27 E+02	3.68 E-04	9.13 E-05
^{147}Sm	3.8716 E+13	2.29 E-08	1.37 E-02	1.74 E-01
^{150}Eu	1.3076 E+04	6.66 E+01	8.90 E-03	6.25 E-04
^{151}Sm	3.2872 E+04	2.63 E+01	7.41 E-04	6.98 E-05
^{152}Eu	4.9461 E+03	1.74 E+02	7.03 E-03	5.14 E-04
^{152}Gd	3.9446 E+16	2.18 E-11	1.31 E-02	5.67 E-01
^{153}Gd	2.4160 E+02	3.53 E+03	6.03 E-04	5.54 E-05
^{154}Eu	3.1385 E+03	2.70 E+02	8.77 E-03	6.66 E-04
^{155}Eu	1.7390 E+03	4.84 E+02	6.53 E-04	9.65 E-05
^{170}Tm	1.2860 E+02	5.97 E+03	1.90 E-03	6.12 E-05
^{175}Hf	7.0000 E+01	1.07 E+04	2.16 E-03	1.30 E-05
^{181}Hf	4.2390 E+01	1.70 E+04	3.85 E-03	3.59 E-05
^{182}Ta	1.1443 E+02	6.27 E+03	8.46 E-03	1.04 E-04
^{185}W	7.5100 E+01	9.40 E+03	7.53 E-04	1.75 E-06

Table C-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{187}Re	1.5888 E+13	4.39 E+08	3.91 E-06	1.26 E-07
^{195}Au	1.8609 E+02	3.60 E+03	5.10 E-04	3.01 E-05
^{203}Hg	4.6612 E+01	1.38 E+04	1.75 E-03	1.70 E-05
^{204}Tl	1.3806 E+03	4.64 E+02	1.38 E-03	5.60 E-06
^{207}Bi	1.1523 E+04	5.47 E+01	9.12 E-03	4.66 E-05
^{210}Pb	8.1449 E+03	7.63 E+01	6.62 E-05	3.16 E-02
^{210}Po	1.3838 E+02	4.49 E+03	3.26 E-02	2.18 E-02
^{226}Ra	5.8439 E+05	9.89 E+01	2.89 E-02	2.00 E-02
^{227}Ac	7.9524 E+03	7.23 E+01	1.46 E-03	4.00 E+00
^{228}Ra	2.1001 E+03	2.73 E+02	2.71 E-04	1.11 E-02
^{228Th}	6.9874 E+02	8.20 E+02	3.27 E-02	7.95 E-01
^{229Th}	2.6809 E+06	2.13 E-01	3.08 E-02	5.00 E+00
^{230Th}	2.7532 E+07	2.06 E-02	2.83 E-02	7.58 E-01
^{231}Pa	1.1965 E+07	4.72 E-02	3.08 E-02	2.99 E+00
^{232}Th	5.1317 E+12	1.10 E-07	2.42 E-02	3.81 E+00
^{232}U	2.5165 E+04	2.24 E+01	3.21 E-02	1.53 E+00
^{233}U	5.8147 E+07	9.64 E-03	2.91 E-02	3.15 E-01
^{234Th}	2.4100 E+01	2.32 E+04	1.49 E-04	8.16 E-05
^{234}U	8.9667 E+07	6.26 E-043	2.88 E-02	3.08 E-01
^{235}U	2.5706 E+11	2.16 E-06	2.86 E-02	2.86 E-01
^{236}Pu	1.0439 E+03	5.30 E+02	3.48 E-02	3.37 E-01
^{236}U	8.5540 E+09	6.47 E-05	2.71 E-02	2.92 E-01
^{237}Np	7.8162 E+08	7.05 E-04	2.96 E-02	1.25 E+00
^{238}Pu	3.2032 E+04	1.71 E+01	3.31 E-02	9.13 E-01
^{238}U	1.6319 E+12	3.36 E-07	2.53 E-02	2.75 E-01
^{239}Pu	8.8060 E+06	6.21 E-02	3.11 E-02	1.00 E+00
^{240}Pu	2.3971 E+06	2.28 E-01	3.10 E-02	1.00 E+00
^{241}Am	1.5786 E+05	3.44 E+00	3.33 E-02	1.03 E+00
^{241}Pu	5.2412 E+03	1.03 E+02	3.30 E-05	1.92 E-02
^{242m}Am	5.1499 E+04	1.05 E+01	2.37 E-04	9.91 E-01
^{242}Cm	1.6280 E+02	3.31 E+03	3.68 E-02	4.02 E-02
^{242}Pu	1.3634 E+08	3.96 E-03	2.93 E-02	9.56 E-01
^{243}Am	2.6918 E+06	2.00 E-01	3.22 E-02	1.02 E+00
^{243}Cm	1.0629 E+04	5.16 E+01	3.73 E-02	7.15 E-01
^{244}Cm	6.6109 E+03	8.09 E+01	3.50 E-02	5.77 E-01

Table C-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)	Dose equivalent curie correction factor
^{244}Pu	2.9512 E+10	1.83 E-05	2.77 E-02	9.39 E-01
^{245}Cm	3.1046 E+06	1.72 E-01	3.40 E-02	1.06 E+00
^{246}Cm	1.7276 E+06	3.07 E-01	3.25 E-02	1.05 E+00
^{247}Bk	5.0403 E+05	1.05 E+00	3.56 E-02	1.34 E+00
^{247}Cm	5.6978 E+09	9.29 E-05	3.36 E-02	9.65 E-01
^{248}Cm	1.2418 E+08	4.24 E-03	3.06 E-02	3.85 E+00
^{249}Cf	1.2820 E+05	4.09 E+00	3.93 E-02	1.34 E+00
^{250}Cf	4.7774 E+03	1.09 E+02	3.63 E-02	6.10 E-01
^{250}Cm	3.2872 E+06	2.07 E-01	2.19 E-04	2.18 E+01
^{251}Cf	3.2799 E+05	1.59 E+00	3.74 E-02	1.37 E+00
^{252}Cf	9.6607 E+02	5.38 E+02	3.69 E-02	3.65 E-01
^{254}Es	2.7570 E+02	1.86 E+03	3.92 E-02	9.56 E-02

* When this parent-daughter pair are in secular equilibrium, only the activity of the parent nuclide should be considered in performing the calculations. E.g., if ^{90}Sr–^{90}Y are in secular equilibrium in the waste, the thermal power for both nuclides would be determined by multiplying the ^{90}Sr activity by the heat of the decay for the ^{90}Sr–^{90}Y pair.

Table C-2. Low-level radiological content limits.

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{3}H	4.4 E+00	9.9 E+04	NL	4.00 E+07	5.00 E+02
^{7}Be	NL	NL	NL	2.64 E+07	6.59 E+05
^{10}Be	NL	1.1 E+00	2.4 E+02	1.00 E+04	2.50 E+02
^{14}C	1.3 E-04	9.1 E-02	2.1 E+01	1.76 E+06	4.41 E+04
^{14}C act. metal[c]	1.3 E-04	9.1 E-01	2.1 E+02	1.76 E+06	4.41 E+04
^{22}Na	NL	NL	NL	4.29 E+05	1.07 E+04
^{32}P	NL	NL	NL	2.31 E+05	5.77 E+03
^{35}S	NL	NL	NL	1.46 E+06	3.66 E+04
^{36}Cl	3.1 E-05	6.4 E-05	1.4 E-01	1.70 E+05	4.17 E+03
^{40}K	NL	1.8 E-03	3.8 E-01	3.00 E+05	7.50 E+03
^{45}Ca	NL	NL	NL	5.45 E+05	1.36 E+04
^{46}Sc	NL	NL	NL	1.22 E+05	3.06 E+03
^{49}V	NL	NL	NL	1.05 E+07	2.63 E+05
^{51}Cr	NL	NL	NL	1.00 E+07	2.50 E+05
^{54}Mn	NL	NL	NL	5.22 E+05	1.30 E+04
^{55}Fe	NL	NL	NL	1.33 E+06	3.33 E+04
^{56}Co	NL	NL	NL	9.16 E+04	2.29 E+03
^{57}Co	NL	NL	NL	4.29 E+05	1.07 E+04
^{58}Co	NL	NL	NL	3.24 E+05	8.11 E+03
^{59}Fe	NL	NL	NL	2.35 E+05	5.88 E+03
^{59}Ni	NL	3.9 E+00	8.5 E+02	2.86 E+06	7.14 E+04
^{59}Ni act. metal[c]	NL	3.9 E+01	8.5 E+03	2.86 E+06	7.14 E+04
^{60}Co	NL	7.5 E+01	NL	1.82 E+04	4.55 E+02
^{60}Co act. metal[c]	NL	7.5 E+02	NL	1.82 E+04	4.55 E+02
^{63}Ni	NL	5.9 E+00	2.0 E+04	1.20 E+06	3.00 E+04
^{63}Ni act. metal[c]	NL	5.9 E+01	2.0 E+05	1.20 E+06	3.00 E+04
^{65}Zn	NL	NL	NL	1.97 E+05	4.92 E+03
^{68}Ge	NL	NL	NL	7.02 E+04	1.75 E+03
^{75}Se	NL	NL	NL	4.29 E+05	1.07 E+04
^{79}Se	3.4 E-05	5.1 E-01	1.1 E+02	3.87 E+05	9.68 E+03
^{82}Sr	NL	NL	NL	5.91 E+04	1.48 E+03
^{85}Kr	NL	NL	NL	2.11 E+09	2.63 E+04
^{85}Sr	NL	NL	NL	1.97 E+06	4.92 E+04
^{86}Rb	NL	NL	NL	5.45 E+05	1.36 E+04

Table C-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{88}Y	NL	NL	NL	1.29 E+05	3.24 E+03
^{89}Sr	NL	NL	NL	6.67 E+05	1.67 E+04
^{90}Sr–^{90}Y	NL	1.6 E-02	5.4 E+04	1.50 E+04	3.75 E+02
^{93}Mo	2.1 E-04	8.7 E-01	2.0 E+02	1.28 E+05	3.19 E+03
$93m_{Nb}$	NL	NL	NL	1.21 E+05	3.03 E+03
^{93}Zr	NL	2.50 E+00	5.40 E+02	4.62 E+03	1.15 E+02
^{94}Nb	NL	2.2 E-04	4.8 E-02	9.23 E+03	2.31 E+02
^{94}Nb act.[c]	NL	2.2 E-03	4.8 E-01	9.23 E+03	2.31 E+02
^{95}Nb	NL	NL	NL	5.71 E+05	1.43 E+04
95_{Zr}–$95m_{Nb}$	NL	NL	NL	9.23 E+04	2.31 E+03
^{99}Tc	2.1 E-04	2.3 E-02	5.0 E+00	4.00 E+05	1.00 E+04
^{103}Ru–^{103m}Rh	NL	NL	NL	3.87 E+05	9.68 E+03
^{106}Ru–^{106}Rh	NL	NL	NL	8.00 E+03	2.00 E+02
^{107}Pd	NL	1.5 E+01	3.3 E+03	2.86 E+05	7.14 E+03
^{108m}Ag	NL	NL	NL	2.15 E+04	5.39 E+02
^{109}Cd	NL	NL	NL	2.45 E+04	6.12 E+02
^{110m}Ag–^{110}Ag	NL	NL	NL	1.00 E+04	2.50 E+02
^{113m}Cd	NL	7.6 E-01	NL	1.79 E+03	4.48 E+01
^{113}Sn	NL	NL	NL	3.24 E+05	8.11 E+03
^{119m}Sn	NL	NL	NL	6.00 E+05	1.50 E+04
^{121m}Sn	NL	6.7 E-01	2.2 E+04	3.08 E+05	7.69 E+03
^{121}Te	NL	NL	NL	1.91 E+06	4.77 E+04
^{123}Te	NL	NL	NL	1.38 E+05	3.44 E+03
^{124}Sb	NL	NL	NL	1.38 E+05	3.45 E+03
^{125}I	NL	NL	NL	5.00 E+04	1.25 E+00
^{126}Sn–^{126m}Sb	NL	1.6 E-04	3.4 E-02	3.64 E+04	9.09 E+02
^{125m}Te	NL	NL	NL	2.18 E+06	5.45 E+04
^{125}Sb	NL	NL	NL	2.79 E+05	6.98 E+03
^{127m}Te–^{127}Te	NL	NL	NL	1.67 E+05	4.17 E+03
^{129}I	1.0 E-06	8.5 E-03	1.8 E+00	7.06 E+03	1.76 E-01
^{129m}Te	NL	NL	NL	1.56 E+05	3.90 E+03
^{131m}Xe	NL	NL	NL	7.50 E+08	9.38 E+03
^{133}Ba	NL	7.1 E-01	NL	4.62 E+05	1.15 E+04
^{134}Cs	NL	NL	NL	8.57 E+04	2.14 E+03

Table C-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{135}Cs	NL	1.6 E-01	3.5 E+01	8.03 E+05	2.00 E+04
^{137}Cs–^{137m}Ba	NL	5.5 E-03	1.2 E+04	1.20 E+05	3.00 E+03
^{140}Ba	NL	NL	NL	3.87 E+05	9.68 E+03
^{141}Ce	NL	NL	NL	4.14 E+05	1.03 E+04
^{144}Ce–^{144}Pr	NL	NL	NL	1.00 E+04	2.50 E+02
^{147}Nd	NL	NL	NL	5.45 E+05	1.36 E+04
^{147}Pm	NL	NL	NL	9.23 E+04	2.31 E+03
^{147}Sm	NL	1.7 E-02	3.7 E+00	2.86 E+01	7.14 E-01
^{150}Eu	NL	1.4 E-03	6.7 E+02	1.38 E+04	3.45 E+02
^{151}Sm	NL	4.6 E+01	2.1 E+05	7.06 E+04	1.76 E+03
^{152}Eu	NL	4.8 E-02	NL	1.74 E+04	4.35 E+02
^{152}Gd	NL	6.4 E-03	1.4 E+00	3.64 E+00	9.09 E-02
^{153}Gd	NL	NL	NL	1.09 E+05	2.73 E+03
^{154}Eu	NL	7.5 E-01	NL	1.32 E+04	3.30 E+02
^{155}Eu	NL	NL	NL	6.67 E+04	1.67 E+03
^{170}Tm	NL	NL	NL	1.38 E+05	3.46 E+03
^{175}Hf	NL	NL	NL	6.52 E+05	1.63 E+04
^{181}Hf	NL	NL	NL	1.23 E+05	3.07 E+03
^{182}Ta	NL	NL	NL	8.00 E+04	2.00 E+03
^{185}W	NL	NL	NL	4.62 E+06	1.15 E+05
^{187}Re	3.3 E-02	3.6 E+01	7.8 E+03	6.32 E+07	1.58 E+06
^{195}Au	NL	NL	NL	2.81 E+05	7.03 E+03
^{203}Hg	NL	NL	NL	5.00 E+05	1.25 E+04
^{204}Tl	NL	NL	NL	1.51 E+06	3.78 E+04
^{207}Bi	NL	TBD	TBD	1.82 E+05	4.54 E+03
^{210}Pb	NL	3.7 E-02	2.1 E+06	1.82 E+02	4.55 E+00
^{210}Po	NL	NL	NL	1.82 E+02	4.55 E+00
^{226}Ra	NL	1.7 E-04	4.3 E-02	4.44 E+02	1.11 E+01
^{227}Ac	NL	4.2 E-03	3.0 E+05	3.08 E-01	7.69 E-03
^{228}Ra	NL	1.7 E+01	NL	8.57 E+02	2.14 E+01
^{228Th}	NL	NL	NL	7.06 E+00	1.76 E-01
^{229Th}	NL	4.4 E-04	9.8 E-02	7.06 E-01	1.76 E-02
^{230Th}	NL	2.1 E-03	1.5 E-01	4.62 E+00	1.15 E-01
^{231}Pa	NL	1.4 E-04	3.0 E-02	1.09 E+00	2.73 E-02
^{232}Th	NL	1.1 E-04	2.3 E-02	8.57 E-01	2.14 E-02

Table C-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
Total U	1.4 E-05	NL	NL	NL	NL
^{232}U	See Total U	4.6 E-04	4.6 E+00	5.45 E+00	1.36 E-01
^{233}U	See Total U	7.4 E-03	9.7 E-01	2.67 E+01	6.67 E-01
^{234Th}	NL	NL	NL	1.00 E+05	2.50 E+03
^{234}U	See Total U	8.9 E-03	1.9 E+00	2.73 E+01	6.82 E-01
^{235}U	See Total U	2.8 E-03	5.0 E-01	2.93 E+01	7.32 E-01
^{236}Pu	NL	NL	NL	1.40 E+01	3.49 E-01
^{236}U	See Total U	9.5 E-03	2.0 E+00	2.86 E+01	7.14 E-01
^{237}Np[d]	1.1 E-05	6.8 E-04	1.5 E-01	2.55 E+00	6.38 E-02
^{238}Pu[d]	NL	4.7 E-03	2.4 E+01	5.22 E+00	1.30 E-01
^{238}U	See Total U	5.7 E-03	1.2 E+00	3.08 E+01	7.69 E-01
^{239}Pu[d]	NL	1.9 E-03	4.2 E-01	4.62 E+00	1.15 E-01
^{240}Pu[d]	NL	1.9 E-03	4.3 E-01	4.62 E+00	1.15 E-01
^{241}Am[d]	NL	2.1 E-03	8.5 E-01	4.44 E+00	1.11 E-01
^{241}Pu	NL	6.4 E-02	2.5 E+01	2.35 E+02	5.88 E+00
^{242m}Am[d]	NL	1.9 E-03	1.6 E+00	4.62 E+00	1.15 E-01
^{242}Cm	NL	NL	NL	2.03 E+02	5.08 E+00
^{242}Pu[d]	NL	2.0 E-03	4.3 E-01	5.00 E+00	1.25 E-01
^{243}Am[d]	NL	1.0 E-03	2.3 E-01	4.44 E+00	1.11 E-01
^{243}Cm[d]	NL	1.8 E-02	3.4 E+02	6.67 E+00	1.67 E-01
^{244}Cm	NL	1.4 E-01	1.6 E+02	8.57 E+00	2.14 E-01
^{244}Pu[d]	NL	6.1 E-04	1.3 E-01	5.00 E+00	1.25 E-01
^{245}Cm[d]	NL	1.3 E-03	2.2 E-01	4.44 E+00	1.11 E-01
^{246}Cm[d]	NL	1.8 E-03	4.2 E-01	4.29 E+00	1.07 E-01
^{247}Bk[d]	NL	TBD	TBD	2.98 E+00	7.44 E-02
^{247}Cm[d]	NL	5.6 E-04	1.2 E-01	4.80 E+00	1.20 E-01
^{248}Cm[d]	NL	5.1 E-04	1.1 E-01	1.21 E+00	3.03 E-02
^{249}Cf[d]	NL	TBD	TBD	2.96 E+00	7.41 E-02
^{250}Cf	NL	TBD	TBD	6.74 E+00	1.69 E-01
^{250}Cm[d]	NL	TBD	TBD	2.13 E-01	5.33 E-03
^{251}Cf[d]	NL	TBD	TBD	2.91 E+00	7.26 E-02

Table C-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Noncombustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{252}Cf	NL	NL	NL	1.43 E+01	3.57 E-01
^{254}Es	NL	NL	NL	5.22 E+01	1.30 E+00

Ci/m^3 = curies per cubic meter.

NL = no applicable limit for this isotope.

TBD = a limit is under development.

a. Noncombustible waste means containerized waste forms that show no evidence of combustion or decomposition on exposure to 538 °C (1,000 °F) for 10 minutes.

b. The combustible waste limit should be used for containerized waste forms that do not meet the definition of noncombustible waste.

c. Limit for isotope in activated metal.

d. TRU isotope (half-life >20 years)